

# MONTHLY REPORT

MARCH , 1944

OFFICE OF  
MALARIA CONTROL IN WAR AREAS  
ATLANTA , GEORGIA



## SPECIAL REPORTS:

"In-Service Training" By Herbert Knutson , P.A. Sanitarian (R)

"Complement Fixation Test For Malaria" By S.B. Freeborn, Senior Surgeon (R),  
Malariaologist



RESTRICTED



TABLE I

## MCWA LARVICIDE AND MINOR DRAINAGE PROJECTS

MARCH 1 - 31, 1944

STATE	Areas in Opera- tion	War Estab- lish- ments Pro- tected	LARVICIDAL WORK			OTHER WORK					Total	Average
			Larvicide Used		Surfaces Treated	Ditching		Cleaning	Clearing	Water Surf. Eliminated Acres	Man	Men
			Oil Gals.	Paris Green Lbs.		Acres	Cu.Yds.	Lin.Ft.	Lin.Ft.		Acres	Hours
Alabama	5	73	10	---	0.7	1,327	4,850	19,325	3.7	5.9	7,599	45
Arkansas	6	70	---	---	---	2,191	24,896	233,729	23.5	15.3	13,575	77
California	5	29	1,578	15	149.9	5,564	140,707	27,227	3.3	18.3	5,404	29
D. C.	1	25	---	---	---	598	3,695	2,255	---	---	2,252	11
Florida	16	141	230	---	4.7	7,312	63,658	578,621	23.7	12.7	38,429	192
Georgia	12	101	---	185	138.4	1,412	11,699	142,565	24.2	20.6	23,944	124
Illinois*	1	56	---	---	---	---	---	---	1.0	---	616	3
Indiana	1	44	---	---	---	---	---	7,560	---	---	520	6
Kentucky	2	45	---	---	---	175	2,330	4,085	---	2.4	1,224	7
Louisiana	8	68	16,369	---	999.0	9,675	88,972	324,206	78.5	60.8	61,334	337
Maryland	1	29	---	---	---	922	2,090	8,669	1.9	3.7	2,780	16
Mississippi	8	55	437	---	11.5	1,275	14,327	113,655	38.2	9.1	16,292	85
Missouri	4	34	---	---	---	419	3,911	16,755	5.7	0.5	3,079	17
North Carolina	8	72	---	---	---	1,691	17,168	231,471	27.2	22.9	17,710	100
Oklahoma	3	38	---	---	---	725	5,700	1,000	5.3	2.5	3,112	17
Puerto Rico	4	19	200	3,647	1,427.7	3,914	13,381	108,831	13.5	0.2	54,940	317
South Carolina	10	111	---	---	---	1,049	24,174	239,140	54.9	19.7	18,448	94
Tennessee	2	69	---	---	---	1,137	6,690	4,365	7.5	5.5	7,451	40
Texas	14	164	4,238	50	417.2	4,004	35,332	434,219	83.4	102.4	34,785	174
Virginia	4	99	---	---	---	6,795	86,661	33,441	24.8	6.0	23,080	134
Total	115	1,298	23,062	3,897	3,149.1	50,685	550,241	2,531,119	420.3	308.5	336,574	1,925
February Total	105	1,298	3,671	5,419	1,010.6	42,389	401,521	1,331,829	313.2	411.2	297,587	1,820

\*Reconnaissance Surveys

TABLE II

## MCWA MAJOR DRAINAGE PROJECTS

MARCH 1 - 31, 1944

STATE	No. of Projects	Clearing Brushing Acres	Channel or Ditch Cleaning Lin.Ft.	New Ditching				Fill Cu.Yds.	Ditch Lining Placed Sq.Ft. Lin.Ft.		Underground Drains Lin.Ft.	Water Surf. Eliminated Acres	Total Man Hours
				Hand	Lin.Ft. Mach.	Dynamite	Total Cu.Yds.						
Alabama	2	---	650	---	---	1,350	940	---	---	---	---	1.0	649
Arkansas	3	0.5	5,800	640	1,280	3,250	3,207	110	---	---	580	118.3	1,748
Florida	1	2.0	4,020	500	---	---	83	---	---	---	---	1,665	---
Indiana	1	0.4	---	---	---	---	---	---	---	---	---	---	198
Kentucky	2	---	---	851	---	200	512	---	---	---	---	---	1,328
Louisiana	1	3.4	---	---	---	---	---	2,351	---	---	---	---	171
Mississippi	2	---	---	1,490	---	---	258	50	5,651	908	---	---	3,787
Missouri	1	---	---	---	---	2,250	1,500	---	---	---	---	---	200
North Carolina	9	7.8	35,957	13,287	1,078	10,908	13,708	2,907	---	---	---	58.5	18,073
South Carolina	12	14.4	56,368	32,434	1,955	16,160	15,874	2,948	---	---	1,560	53.9	33,492
Tennessee	2	0.1	100	1,678	---	---	776	132	---	---	60	0.5	2,138
Texas	6	1.5	700	7,413	1,100	---	2,661	282	1,742	396	93	127.0	7,358
Virginia*	1	---	---	---	---	---	---	---	---	---	---	---	784
Total	43	30.1	103,595	58,293	5,413	34,118	39,519	8,780	7,393	1,304	2,293	359.2	71,591
February Total	48	46.8	72,919	64,999	5,420	46,768	49,678	3,365	6,923	1,737	3,034	668.8	97,951

\* 1620 S.F. Precast Ditch Lining prepared - not placed.

TABLE III

## MCWA PERSONNEL ON DUTY ON MARCH 31, 1944 AND TOTAL PAYROLL FOR MONTH OF MARCH

MARCH 1 - 31, 1944

STATE	Commissioned		Prof. & Sci.		Sub-Prof. (1)		C. A. F.		Custodial		Total		Percent of Total	
	No.	Pay	No.	Pay	No.	Pay	No.	Pay	No.	Pay	No.	Pay	No.	Pay
Alabama	6	1,555	1	264	3	444	3	483	45	4,897	58	7,643	2.0	1.9
Arkansas	7	1,899	4	1,111	20	3,822	6	1,011	70	6,980	107	14,823	3.8	3.7
California	2	570	---	---	6	1,186	1	330	23	3,512	32	5,598	1.1	1.4
D. C.	1	333	1	319	4	689	1	380	5	868	12	2,589	0.4	0.7
Florida	6	1,847	6	1,756	15	3,124	5	928	195	25,093	227	32,748	8.0	8.2
Georgia	7	1,936	3	906	33	6,254	6	939	98	12,034	147	22,069	5.2	5.5
Illinois	5	1,375	2	527	---	---	1	152	2	277	10	2,331	0.4	0.6
Indiana	2	570	---	---	---	---	---	---	6	795	8	1,365	0.3	0.4
Kentucky	3	737	3	527	2	416	1	164	10	1,375	19	3,219	0.7	0.8
Louisiana	11	3,061	3	1,590	36	7,695	1	915	300	38,365	351	51,626	12.3	12.9
Maryland	2	477	---	---	4	750	2	410	13	1,691	21	3,328	0.7	0.8
Mississippi	5	1,474	3	527	9	1,902	3	556	92	11,514	112	15,973	3.9	4.0
Missouri	2	570	---	---	12	2,358	1	152	13	1,009	28	4,089	1.0	1.0
North Carolina	6	1,552	6	1,925	10	1,993	3	574	192	23,693	217	29,737	7.6	7.5
Oklahoma	2	578	2	583	8	1,646	1	146	11	1,449	24	4,402	0.8	1.1
Puerto Rico	8	2,682	1	323	8	2,007	7	1,305	393	18,902	417	25,219	14.7	6.3
South Carolina	5	1,522	5	1,429	25	5,095	5	748	270	34,573	310	43,367	10.9	10.9
Tennessee	4	1,140	2	477	6	1,430	2	438	45	5,663	59	9,148	2.1	2.3
Texas	7	1,959	4	1,322	25	5,486	5	884	209	26,300	250	35,951	8.8	9.0
Virginia	3	895	2	688	11	2,247	2	428	127	16,041	145	20,259	5.1	5.1
<b>ARDES AEGYPTI</b>														
Alabama	---	---	---	---	7	465	---	63	---	---	7	528	0.2	0.1
Florida	---	---	---	---	27	4,449	1	82	1	152	29	4,683	1.0	1.2
Georgia	2	570	---	---	11	1,885	2	329	1	112	16	2,896	0.6	0.7
Louisiana	1	285	1	264	16	3,050	1	146	---	---	19	3,745	0.7	0.9
South Carolina	1	285	---	---	11	1,971	1	164	1	125	14	2,545	0.5	0.6
Texas	4	1,140	1	346	3	3,789	---	146	9	1,386	17	6,807	0.6	1.7
H.Q. & Dist. (2)	61	19,719	8	2,523	17	3,286	92	16,265	9	973	187	42,766	6.6	10.7
Total	163	48,691	58	17,407	329	67,439	153	28,138	2,140	237,779	2,843	399,454	100.0	100.0
Percent of Total	5.7	12.2	2.0	4.4	11.6	16.9	5.4	7.0	75.3	59.5	100.0	100.0		

(1) Includes Entomological Inspectors

(2) Includes Headquarters and District Offices, malaria survey, Imported malaria control, special investigations and employees temporarily attached to Headquarters pending assignment to states.



# MALARIA CONTROL IN WAR AREAS

## *Monthly Report for March 1944*

### THE IN-SERVICE ORIENTATION AND TRAINING PROGRAM AT MCWA HEADQUARTERS

By Herbert Knutson, P.A. Sanitarian (R)  
In charge, In-service.Training Section

One of the primary functions of the Training and Education Division of the Office of Malaria Control in War Areas is the orientation and training of newly appointed personnel. Designed primarily for new employees with little experience in malaria control, the course also serves as a refresher for the more experienced men. The curriculum is modified and adapted to meet the needs of the individual, depending on his previous training. Individual attention is possible because ordinarily only two or three trainees enter the course at one time.

Thus far the trainees have consisted chiefly of newly commissioned officers and non-commissioned personnel with some knowledge of the general principles of malaria control. Very few, however, were acquainted with U. S. Public Health Service policies and procedures, or with the actual techniques and practices of MCWA control operations in the field. It is obvious that the new officer or supervisor should have a thorough knowledge of these matters in order to instruct foremen, inspectors, and laborers in the field. In the final analysis, the effectiveness of the MCWA program is governed by the ability of the supervisors to operate projects smoothly, and this requires intelligent and careful work at the area level. The in-service training curriculum is designed to prepare the professional MCWA worker for this supervisory job and to enable him to pass on technical information to sub-professional personnel.

#### ORIENTATION

Upon arrival at Headquarters the trainee first calls on the Officer in Charge, and then reports to the Chief of the Training and Education Division. After a brief interview, he is assigned a desk in the training room with a microscope and general reference books on malaria control. A library containing more than 200 selected articles pertaining to malaria control, and a large collection of films, film strips, and slides are available for reference in the training room.

Instruction begins with lectures on the organization, customs, and history of the Public Health Service, and on the general program of the Office of Malaria Control in War Areas. Supplementary readings concerning the Public Health Service include notes taken at the Orientation Course given at Bethesda; the Regulations of the Public Health Service; portions of Public Health Reports; unnumbered circulars, memoranda and circular letters from the Central Office; and Federal Security Agency orders. Required supplementary readings include the MCWA Monthly and Annual Reports, the Manual of Operations, the Organization Report, selected field and inter-office memoranda, miscellaneous circular letters and bulletins.



Newly commissioned officers are aided in the purchase of uniforms, and are instructed in military courtesies, customs, and the relationship of the Public Health Service to other uniformed services. The Officer's Guide and the Uniform Regulations of the Public Health Service make up a portion of the supplementary literature.

#### TECHNICAL TRAINING FOR MCWA ACTIVITIES

*General Aspects.* An illustrated lecture serves as an introduction to the technical training. It deals with the relationship of malaria to its vector, the logical approaches to malaria control, and the inter-relationships of medical, entomological and engineering sciences in malaria control work. The lecture is supplemented by moving pictures on malaria and malaria control, including the following: "Malaria: Cause and Control" (War Department); "Malaria" (USPHS film strip); "Malaria Control" (TVA); "Malaria" (British Shell Oil Co.); "Winged Scourge" (Walt Disney for Coordinator of Inter-American Affairs); and "Mosquitoes" (USDA). There are also a number of selected publications for readings.



Anopheline identification



Adult mosquito collecting technique

*Entomological Aspects.* Under the guidance of an entomologist, studies are begun with a general consideration of the life history, seasonal history, habits and medical importance of mosquitoes. A detailed taxonomic study of larval and adult specimens of the twelve anophelines which occur in the United States is undertaken with the aid of slides, motion pictures and wall charts. Trainees destined for entomological duties also study culicine identification.

The habits of the various anophelines are reviewed in detail, including breeding places, larval and adult population trends, flight ranges, dispersal flights, attraction to light traps and artificial and natural resting places, biting habits, hibernation, and relationships to malaria transmission.

A discussion of the role that entomological services play in the MCWA program follows the study of mosquito biology. This includes the mapping and establishment of larval and adult index stations and light traps, details of the techniques of inspection work in the field, and the use of field and office forms. The importance and methods of accurate interpretation of entomological data are emphasized, and common difficulties encountered in interpretation are discussed. Students are aided in mosquito identification by an MCWA training film. Principles and practices of conducting an entomological survey are illustrated by the Public Health Service film "*Anopheles Census*." More than forty selected articles form the supplementary reading material.



**Engineering Aspects.** During this phase of training the new trainees are instructed by an engineer in the routine field office set-up, and the application of engineering principles to malaria control. Mapping standards, the location of watered areas, and the correlation between these areas and entomological and malarial surveys are discussed.

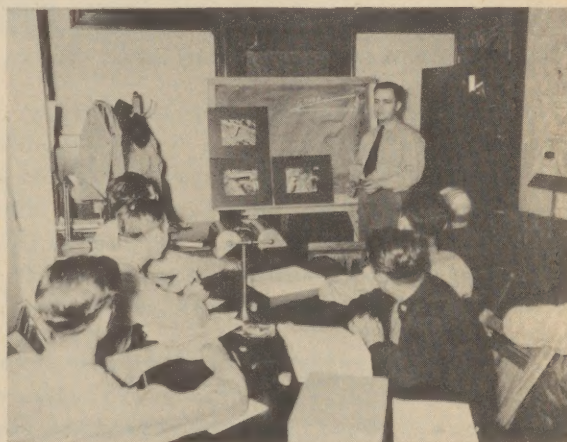
The use of larvicides in malaria control is presented, including specifications, mixing, costs, and methods of application. A motion picture on larviciding and lantern slides serve to illustrate the use of larviciding equipment.

The various types of minor and major drainage and filling are discussed, with special reference to their use on the MCWA program, along with the costs, and the use of the machines and tools involved. The trainees are shown a motion picture on dynamiting and a slide film showing ditch linings.

Other methods of malaria mosquito control are presented, including clearing, water fluctuation, fish, adult destruction, new insecticides, and mosquito proofing and screening. The USPHS film "Mosquito Proofing for Malaria Control" is shown.



Demonstration of Duster and Sprayer



Lecture on Drainage Principles

**Medical Aspects.** The complex inter-relationships of man, the parasite, and the mosquito are outlined by a medical officer, and the various stages of the life cycle of the parasite are discussed and demonstrated by microscopic examinations of thick and thin blood smears.

The epidemiology of the disease is then considered, including the world distribution of malaria, its present distribution and trends in the United States, and the various known direct and indirect methods of determining the incidence of the disease. Possible steps in the eradication of the disease are discussed, and the role of drugs in the control and treatment of malaria is reviewed.

**The *Aedes aegypti* Training Program.** Trainees learn the taxonomic characteristics of the yellow fever mosquito and the habits peculiar to that species. Those who are to be assigned to the *aegypti* control program receive detailed instructions concerning the organization and execution of the program. Two films, "Life History of the Yellow Fever Mosquito" and "*Aedes aegypti* Control" are shown to the trainees, and selected readings are provided.



*Field Training.* Through the courtesy and cooperation of the Georgia Department of Public Health, the Valdosta, Georgia area has been made available as a field training area. Here the trainees study an area in actual operation and gain experience in performing many of the activities they will encounter in the field. Plans have been completed for a similar field training area for *Aedes aegypti* control work at Savannah, Georgia.



Larval Collecting Technique    Training at Valdosta    Mapping a Quad Breeding Area

*Administrative Aspects.* Many of the trainees arrive with less information on administration than on any other aspect of their future duties. Following a study of the administrative section of the Manual of Operations, the subjects most apt to be troublesome to technical field workers are discussed. The trainees who will be charged with more administrative responsibilities, such as mobile unit supervisors, sit in a round-table discussion with personnel of the Administrative Division.

*Acquaintance with Headquarters Procedures and Personnel.* Conferences are arranged with the chiefs of the various divisions and sections of the Headquarters Office so that the trainees may become acquainted with all phases of the MCWA program.

*Completion of the Course.* The course is terminated by a general round-table question and discussion period on malaria control activities. Following this the trainee reports to the Chief of the Commissioned Officer Unit for assignment.

#### SUMMARY

Since December, 1943, 34 trainees have completed the course. Sixteen of them are entomologists, 15 are engineers, and three are surgeons. Nineteen of the 34 trainees had had no previous Public Health Service or MCWA experience. The length of the course has averaged two weeks, but has varied with the past malaria control experience of the trainee and the urgency of his new assignment.

In addition to the regular trainees, 12 Public Health Service officers attended selected portions of the course. Eight of these are MCWA officers who reviewed certain technical aspects of malaria control outside of their own specialized fields. The remaining four visiting officers attended the course as partial preparation for their duties with the United Nations Relief and Rehabilitation Administration.



## FIELD NOTES



At the Savannah laboratory Assistant Engineer (R) Earl H. Arnold has designed an attachment for Shur-Shot sprayers to control amounts of spray material released. A removable glass tube fits between two faceplates and is held tight by long bolts with wing nuts. A stem valve at each end permits the release of a measured amount of freon-pyrethrum mixture or other spray material. Such equipment is necessary for comparative tests on insecticides because recording the length of time that material is released through an ordinary Shur-Shot nozzle does not give an accurate measure of the amount of material used.

Assistant Engineer (R) Robert H. Pearson reports the development of a portable tool filing rack that has been used with very satisfactory results in the Leesville, Louisiana area (Fig. 1). By inserting the tool handle through the slot in the rack a steady tripod is formed. Friction of the handle of the tool in the slot, and the resting of the tool blade on the lower brace prevents the tool from turning. The addition of a simple attachment made from a 2" x 8" plank slipped into the rack slot gives a firm support for setting and filing a two man crosscut saw.

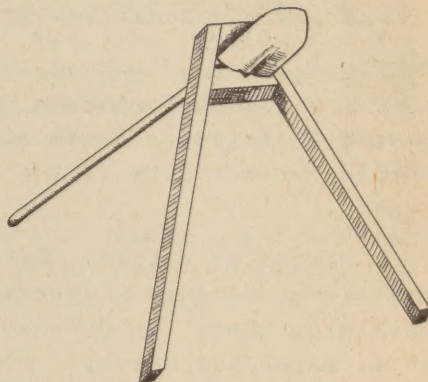


Figure 1

Mr. Pearson has also developed a simple regulating valve for drip barrels. A slot is cut lengthwise through the end of a piece of pipe. The slot may be cut with a hack saw and should extend to about the fifth thread. A cap is then screwed on and adjusted to give the desired amount of drip. If the cap turns too easily when finally adjusted, the slot should be extended through one or more threads. There will be less possibility of tampering if the slot is cut deep enough so that the cap is tight when finally adjusted. (Fig. 2).

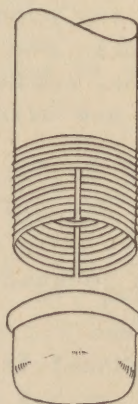


Figure 2

John H. Hause, supervisor of the Key West *Aedes aegypti* control project, has developed a convenient method of aerosol spraying for use by inspectors in routine inspection - correction work. Small aerosol bombs were originally designed for field use and hence are small enough for an inspector to carry. However, they have not been practical for routine *aegypti* work because they soon become exhausted and cannot be refilled. Mr. Hause has added a valve stem to the aerosol bomb, making refilling possible. Bombs are charged with freon as often as necessary. With this simple device the *aegypti* inspector becomes practically self-sufficient, and it is no longer necessary to maintain a separate crew for adult spraying of premises found breeding.

P. A. Engineer (R) Hydrick K. Dickert, area supervisor of Area 12, Aiken, South Carolina reports that breeding occurred last season in an abandoned clay pit with dry, cracked clay bottom. *Anopheles quadrimaculatus* larvae were found in great numbers in water in the cracks. Control was accomplished by raking the cracked area with a potato hook.



## SECTION REPORTS



According to M7 entomological report forms, one area in Florida, one in Louisiana and two in Texas showed sufficient *Anopheles* breeding to require control by the end of March. It is expected that the 1944 breeding season will begin in all southern areas by May first.

In connection with studies on the vectors of filariasis, mosquito density and distribution records in the Headquarters Office were recently summarized by a research aide detailed to this office by Dr. W. H. Wright, Chief, Zoology Laboratory, National Institute of Health.



Compilation and analysis of epidemiological data is in progress for the 120 counties ranking highest according to reported malaria deaths for the period 1938-1942. These 120 counties are shown divided into three groups according to intensity of the malaria problem in a map on the back cover of this report.

Mortality records do not tell the whole story of malaria occurrence and prevalence because of incorrect diagnosis, low death rate and difficulty of determining where the deceased contracted the disease. To supplement mortality data, morbidity surveys are being conducted through the schools of several states. Children are given a questionnaire to be taken home and filled out with the help of their parents. Parents are questioned as to how many cases of malaria occurred within their family during the past year. It is estimated that one-third of the population in the area is reached by this method. Morbidity surveys have been completed for Orangeburg, Berkeley, and Colleton counties in South Carolina, and Lake, Dyer, and Lauderdale counties in Tennessee. Fourteen counties are now being surveyed in Arkansas.



The *Aedes aegypti* educational program in cooperation with the Office of Civilian Defense was completed for Miami during March. Asst. San. (R) Peter G. Cranford was aided in this work by Asst. San. (R) Glen Prock. The next project will be at Jacksonville, Florida in cooperation with Asst. San. (R) Bertram Gross.

All personnel in the *aegypti* control program are being immunized against yellow fever.

P.A. Engineer (R) Wesley E. Gilbertson reports 22 cases of dengue in Honolulu during March. The total number of cases to date is 1456. The breeding index is gradually increasing because of excessive rainfall and because the inspectors are becoming more proficient at locating breeding places. The index for the last half of March was 3.5, the highest city-wide index yet recorded, although many zones are well above this figure. Personnel have now been assigned to rural Oahu, Kauai, Maui, and Hawaii, bringing the total of employees on the program to 398.



Educational activities include the release of four newspaper mats depicting *Aedes aegypti* control. These cartoons were based upon suggestions from field projects and were elaborated by the headquarters staff and produced in Washington.



Mr. Garnet W. Jex, of the Graphics Section, Division of Public Health Methods, worked in Atlanta from March 27 to April 1 completing colored illustrations of the three principal vectors of malaria in the United States. A script was completed for a popular film strip on malaria control.

A 35mm. black and white sound film showing the complete story of an *Anopheles* census was recently reviewed. Sixteen mm. release prints have been ordered. The film is designed for training inspectors and entomologists on the MCWA program. It is timely because of the unusual demands for new surveys. T. E. McNeel, entomologist for District 4, is the "hero" of the film. Following Mr. McNeel through all the steps of setting up an area, selecting larval and adult stations, collecting specimens, contacting the proper authorities, etc., the less experienced man will pick up new ideas and perhaps standardize his routine methods.



Six men completed in-service training during March. New men and several members of the headquarters staff visited the Valdosta field station on April 13 and 14. From March 20 to 31 an orientation course was given to six supervisors of mobile units.



Plans are under way for inauguration of the 1944 control program in the water chestnut areas of the Potomac River. In addition to routine airplane dusting beginning in July and entomological survey work, financial support is to be given to the cutting program. If the plants are cut when they become dense near the end of May, and before the chestnuts mature, elimination of water chestnut is possible. This work is partially financed by MCWA, and is carried on by Army Engineers.

For a number of years Vanderbilt University has sponsored a four month course for sanitation officers of the various state health departments. To give the lectures, authorities in the numerous fields of sanitation are invited. For the past seven years, Nelson H. Rector, Sanitary Engineer (R) has been a member of the faculty for the course, lecturing on malaria control. All phases of the subject are covered, including engineering, medical, entomological, and historical aspects. Each lecture is fully illustrated with slides. This year Mr. Rector's classes were held on May 1, 2, and 3. Representatives from Kansas, Louisiana, Tennessee and Missouri were in attendance.



The Records and Statistics Section reports that the revised semi-monthly form will be used throughout 1944 in all areas, but will be changed in appearance about July 1 to facilitate machine tabulation. No change is contemplated in the actual data requested in the form.

Successful reporting on the above form depends upon careful daily collection of data. Daily report forms will be necessary for this purpose. It is desirable for each area to work out its own form suited to local conditions. Mimeographing of such local report forms will be done by the Headquarters Office if such facilities are not available locally or in the State office.



## HEADQUARTERS NOTES



A "Commissioned Officer Unit" has been established at Headquarters, responsible to the Executive Office, with jurisdiction over the selection and promotion of commissioned and other professional personnel. All officers are reviewed bi-monthly by a board selected to determine which officers shall be recommended for promotion. Recommendations for promotion are based upon meritorious service plus responsibility of work handled.

Official word has been received that "dog tags" and serial numbers are to be issued to all P.H.S. commissioned officers. When a commissioned officer receives his serial number from the Surgeon General and the accompanying circular No. 94, he should send the requested information for his identification tag directly to the office of the P.H.S. District within which he is assigned.

Newly commissioned officers on the MCWA program include: Sanitarian (R) S. W. Simmons, formerly in charge of the laboratory for dog fly control of the U. S. Department of Agriculture located at Panama City, Florida, now Officer in Charge of the Carter Memorial Laboratory, Savannah, Georgia; Assistant Engineer (R) William C. Turnage, formerly with the TVA, Division of Maps and Surveys, now assigned to MCWA in Jackson, Mississippi; Assistant Sanitarian (R) John Russell, assigned to the Mississippi State Board of Health to make salt marsh mosquito surveys in war areas on the Mississippi Gulf coast; and Assistant Sanitarian (R) Frederick W. Ferguson, assigned to the Carter Laboratory.

Changes in assignment have been announced for the following: Assistant Sanitarian (R) John W. Zukel, who has been on temporary duty in Savannah, Georgia has been transferred to Springfield, Illinois, where he will be an assistant in the state of Illinois; Assistant Engineer (R) Silas A. Lacy, formerly area supervisor in Gadsden, Alabama, is now assigned to the mobile unit in District 7; Assistant Sanitarian (R) Albert E. Weyer, recently returned from duty on Typhus Control is now area supervisor in Oklahoma City, Oklahoma; Assistant Sanitarian (R) Leslie D. Beadle has returned to his regular duty as State MCWA Entomologist in Kansas after temporary assignment to malaria surveys; Sanitarian (R) Frank W. Fisk has been assigned to assist with experimental work on insecticides being carried on by the Malaria Investigations Laboratory of the National Institute of Health, Memphis, Tennessee; Assistant Sanitarian (R) L. Edward Perry who assisted in the malaria survey in Tennessee during the winter months will be with the mobile unit in District 8, Denver, Colorado; Assistant Engineer (R) Michael Gold has been assigned to Rome, Georgia as area supervisor; Assistant Engineer (R) Anthony S. Marchese will be area supervisor in Helena, Arkansas; Assistant Sanitarian (R) C. A. Wilson, formerly State MCWA Entomologist in Arkansas has been assigned to District 1 where he will make entomological surveys in New York, Pennsylvania, and New Jersey; P.A. Surgeon Robert L. Smith is now assigned to the Medical Section of the Headquarters Office and is on temporary duty in New York making a survey of splenomegaly; Assistant Sanitarian (R) Clarence M. Tarzwell has been transferred from temporary assignment with the Memphis - Shelby County Health Department to the Carter Laboratory.

John M. Henderson, Sr. Sanitary Engineer (R) who was on temporary duty for eight weeks at the DeLamar Institute of Public Health of Columbia University, 600 West 168th St., New York City has now returned to duty at the Headquarters Office of MCWA



A conference of MCWA district engineers and entomologists was held in Atlanta from April 17 to 19. Highlight of the meeting was the afternoon session on the 19th with Colonel W. A. Hardenbergh, Colonel Michael Blew, Major Samuel C. Dews, Major Stanley J. Carpenter, Captain Andrew P. Morgan, Lieutenant W.D. Reed and Mr. Austin W. Morrill, Jr. as guests representing the Army, and Commander Frank G. Norris and Lieutenant E. C. Peterson representing the Navy. Public Health Service officials in attendance included: Assistant Surgeon General J. K. Hoskins, Medical Director J. W. Mountin, Medical Director C.L. Williams, Medical Director Joseph E. Bolton, Sanitary Engineer Director A. W. Fuchs and Senior Sanitary Engineer H.N. Old.

Senior Surgeon (R) Stanley B. Freeborn delivered a series of four lectures each at the University of Chicago and Northwestern University on mosquito-borne diseases. The lectures were a part of a civil affairs training school under the auspices of the Provost Marshal General's office for training Army and Navy officers who will be detailed to the Allied Military Government.

Prisoner of war camps have recently become important from the standpoint of malaria control. Labor shortages have stimulated the establishment of side camps in areas where critical manpower shortages exist. If such side camps are located in malarious areas or in areas where vectors are present without the disease, a hazard exists, either to the prisoners or to the public in the surrounding area or both. In the Fourth Service Command arrangements have now been made with the Security and Intelligence Division, the Corps of Engineers, and the Surgeon's Office for clearance on selection of prisoner of war side camp sites through State health officers or their State MCWA representatives. This should preclude the possibility of selection of unsuitable sites where control of malaria would cost more than the value of the labor provided by the prisoners. Malaria control labor in the Fourth Service Command may be drawn from prisoners in the camps to be protected but use of such labor is limited, except where otherwise specifically authorized, to 10 prisoners.

MCWA has long been besieged with requests for control of pest mosquitoes (mosquitoes other than malaria, dengue and yellow fever vectors). Desirable though it might be to rid the country of salt marsh *Aedes* or rice field *Psorophora* mosquitoes, the Bureau of the Budget has specifically limited MCWA expenditures to the control of anopheline vectors of malaria, with a small additional appropriation for yellow fever and dengue mosquitoes.

It is unfortunate that the local population tends to judge the effectiveness of this program, not in terms of malaria control, but by actual mosquito bites incurred. It is vital, particularly to future mosquito control operations, that this situation should be clarified in the minds of the public by local health officials. It is hoped that appropriate steps, modified to suit local conditions, will be taken in each community to satisfy this need.

Meanwhile, it is recognized that pest mosquitoes may occasionally become so troublesome as to interfere with the training of troops or with other essential war activities. An agreement has just been completed authorizing both surveys and control of pest mosquitoes upon specific request of the Army. Requests are to be routed through Public Health Service Liaison Officers. MCWA control operations of pest mosquitoes are contingent upon reimbursement by the requesting agencies. It is anticipated that this work will be limited to very few cases of major military importance.



## COMPLEMENT FIXATION TEST FOR MALARIA

Considerable prominence has been given lately to methods of determining the prevalence of malaria. One of the methods, the complement fixation test, has been known for some time but the scarcity and expense of a suitable antigen have mitigated against its use. With the demonstration that the causative organism of chicken malaria, *Plasmodium gallinaceum*, is a suitable source of antigen and can be produced in quantity, it is possible that this technique may be perfected as a usable tool for diagnosis and survey. However, the technique has not yet been perfected to the point where it can be used in the field

Briefly, the complement fixation technique is based on a visual indication of whether the blood serum of a person contains substances capable of interacting with the organisms or toxins that cause a specific disease. While a person suffers from a disease certain specific substances (antibodies) develop in the blood that may play a role in his recovery. One of these substances is known as the amboceptor. The amboceptor, in combination with another substance present in normal as well as convalescent blood, called the complement, can combine to destroy invading organisms. No destruction takes place unless both complement and amboceptor are present. If the amboceptor in the blood serum of a person infected with malaria is added to a test tube containing antigen made from the parasites of chicken malaria and a measured amount of complement, the antigen will be inactivated. However, there is no visible indication that this has occurred.

Malaria antigen + Malaria amboceptor + Complement = Inactivation  
(Parasites) (Blood of infected person) (Measured amount) of antigen

In tests in which amboceptor is present (positive malaria case), it, together with the antigen, uses up or "fixes" all of the complement. When amboceptor is not present (negative for malaria), the complement in the test tube remains free or "unfixed." To visually demonstrate the presence or absence of unfixed complement in the test tube, an entirely different antigen (red blood cells of sheep) and the appropriate amboceptor are added. Sheep cell amboceptor is prepared by injecting red cells of sheep into a rabbit. The blood of the rabbit will then contain sheep cell amboceptor which, in the presence of complement, will destroy the red cells of sheep, releasing hemoglobin and coloring the solution red.

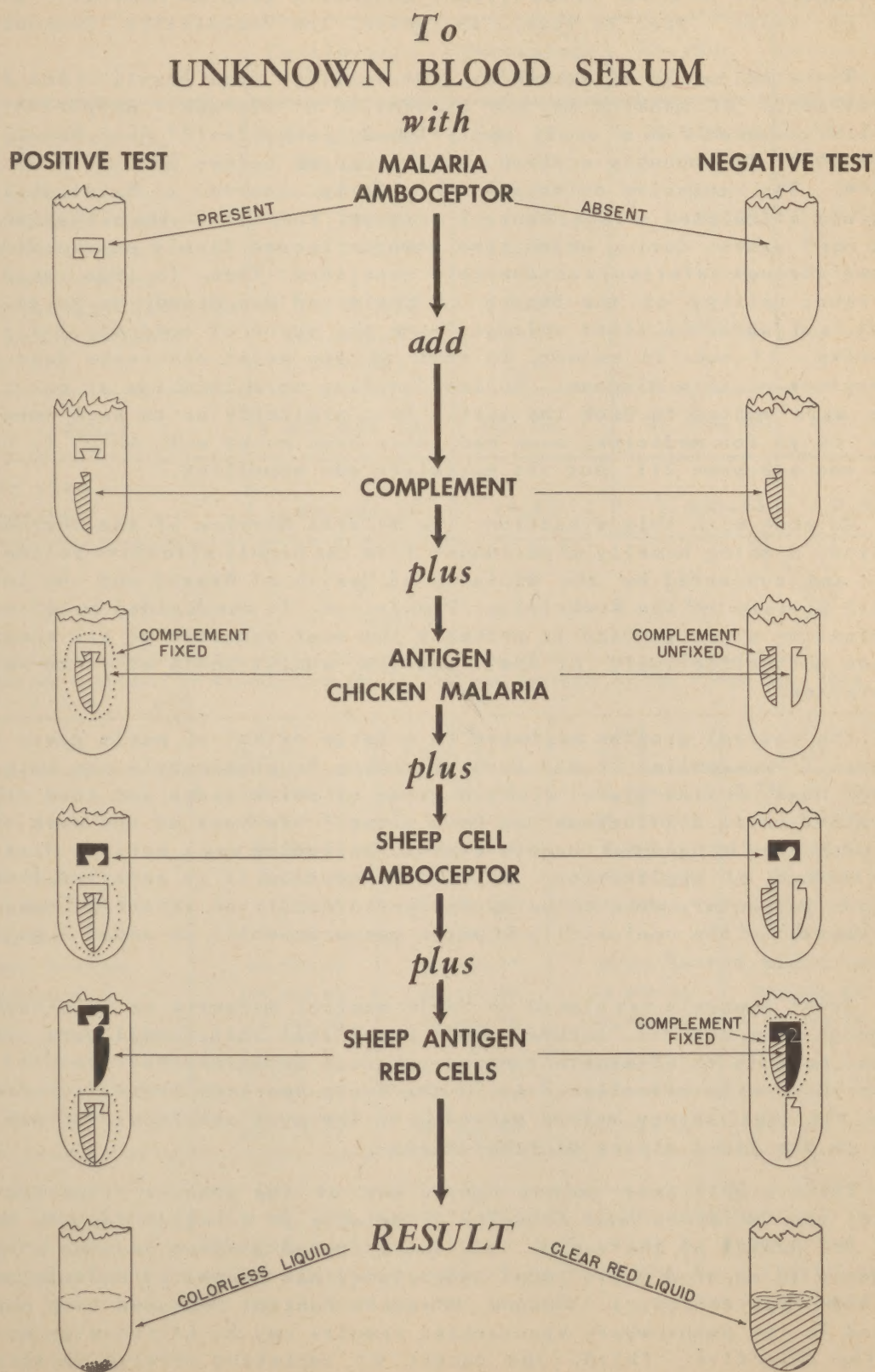
Sheep cell antigen + Sheep cell amboceptor + Complement = Destruction of  
(Red blood cells) (From immunized rabbit) (Measured amount) sheep red cells

If, then, the sheep cell antigen and amboceptor are added to the test tube and the sheep cells are destroyed as evidenced by a red colored fluid, we know that complement must have been present, left over from the uncompleted malaria reaction. This shows that no malaria amboceptor was present in the original fluid and is considered a negative test for malaria.

If, on the other hand, the sheep cell antigen and amboceptor are added to the test tube and the sheep cells remain intact, the fluid will be clear. This indicates that no complement was available, it having been used up in the original malaria reaction in the presence of malaria amboceptor. This is a positive test for malaria. — S.B. Freeborn, Senior Surgeon (R), Malariologist.



# COMPLEMENT FIXATION TEST FOR MALARIA





## LITERATURE REVIEW



Soper, F. L. and D. Bruce Wilson. *Anopheles gambiae* in Brazil, 1930 to 1940. pp. xviii 262. 75 figs., 49 tables. The Rockefeller Foundation, 1943.

The eradication of *Anopheles gambiae* Giles from Brazil is one of the great achievements of mankind in the prevention of disease. *Anopheles gambiae* was first discovered "in a small over-flowed grassy field" near Natal, Brazil, in March 1930. It probably arrived several months before by boat from Dakar, West Africa. Two explosive outbreaks of malaria occurred in Natal during 1930 and 1931 and stimulated a local control program. Thereafter the situation was quiescent for 7 years, during which time *gambiae* became firmly entrenched and slowly spread through relatively unfavorable territory. Then, in 1938, *gambiae* invaded the river valleys of the States of Ceara and Rio Grande do Norte. The Assu, Apodi, and Jaguaribe river valleys "were the scene of epidemic malaria equal in severity, if not in extent, to that of the worst outbreaks described in the literature of this disease...Entire families were laid low at one time. Often none were spared to cook the little food available or to seek more; none were able to go for medicine, even had there been money with which to buy it...Not only was everyone ill, but the mortality was appalling."

To cope with this situation, the Malaria Service of the Northeast was organized, drawing heavily on personnel from the highly effective Yellow Fever Service and supported by the Ministry of Health of Brazil and the International Health Division of the Rockefeller Foundation. It was decided to attempt complete eradication since *gambiae* is probably the most domestic of all anophelines and breeds most effectively in small shallow, sunlit pools of fresh water without vegetation.

The control program was based to a large extent on paris green applied wet or dry. It was applied in dry form by mixing "approximately one kilogram of dry earth, dust, or fine gravel with ten grams of paris green and then repeating the operation until 5 kilograms had been mixed." In most of the work this mixture was dispersed by hand but chronic arsenic poisoning was a serious disadvantage to this method of application. In this connection it is reported that "an over-zealous inspector, who eventually recovered, suffered severely from a public demonstration of the nontoxicity of paris green in which he added a goodly portion of it to his beer."

Great emphasis was placed on adult control measures or "disinsectization", although the authors "secured ample proof that anti-larval work (paris green) alone is able to eliminate *gambiae*, whereas anti-imaginal measures alone were never shown to be effective." As in the South American *aegypti* eradication program, the adult survey method proved to be the most sensitive and was indispensable in the final stages of eradication.

Three significant points emerge out of the *gambiae* situation in Brazil. First, the incidence and severity of malaria in a region depends very largely upon the habits of the vector, the domesticated *gambiae* causing a catastrophic epidemic in an area where local anophelines had supported endemic malaria at a low level for centuries. Second, mosquito control measures have now been perfected to the point where spectacular results may be achieved by concentrating on the objective. Third, the danger of importing foreign vectors is a very real one and must be squarely faced by a civilization on the threshold of an era of international air transport.-- R. L. Usinger, P.A. Sanitarian (R).



TABLE IV

MCWA Encumbrances and Liquidations by Major Items  
For the Month of March 1944

	Continental U.S.	Percentage of Total	Puerto Rico	Percentage of Total
.01 Personal Services	\$ 374,234.28	85.35	\$ 25,219.92	93.15
.02 Travel	20,135.24	4.59	450.00	1.67
.03 Transportation	2,609.56	0.60	-----	----
.04 Communication Services	1,325.00	0.30	25.00	0.09
.05 Rents and Utilities	1,749.76	0.39	-----	----
.06 Printing and Binding	-----	----	-----	----
.07 Other Contractual Services	10,015.13	2.29	-----	----
.08 Supplies and Materials	20,181.31	4.61	1,377.13	5.09
.09 Equipment	8,206.15	1.87	-----	----
Total	\$ 438,456.43	100.00	27,072.05	100.00
Expenses other than Personal Services	64,222.15	14.65	1,852.13	6.85

\* \* \*

Table V

MCWA Encumbrances and Liquidations, by Major Items in Continental United States  
Comparative Statement of Expense for the First Three Quarters of the Fiscal Year 1944

	1st Quarter	2nd Quarter	3rd Quarter	Total	Percentage of Total
.01 Personal Services	\$ 1,319,742.27	1,154,167.85	1,116,434.19	3,590,344.31	83.71
.02 Travel	69,823.95	43,349.86	55,682.93	168,856.74	3.91
.03 Transportation	9,598.49	14,356.19	5,860.21	29,814.89	0.68
.04 Communication Services	2,922.09	3,580.53	3,794.56	10,297.18	0.23
.05 Rents and Utilities	5,495.80	5,585.37	5,565.92	16,647.09	0.37
.06 Printing and Binding	450.00	200.00		650.00	0.14
.07 Other Contractual Services	39,535.19	32,340.57	26,225.96	98,101.72	2.26
.08 Supplies and Materials	138,782.83	86,439.76	68,639.88	293,862.47	6.84
.09 Equipment	31,134.06	14,951.72	34,484.10	80,569.88	1.86
Total	1,617,484.68	1,354,971.85	1,316,687.75	4,289,144.28	100.00
Expenses other than Personal Services	297,742.41	200,804.00	200,253.56	698,799.97	16.29

This is the final issue of the Monthly Report of Malaria Control in War Areas. Reports for the remainder of the fiscal year will be summarized in a general account of the year's activities. Starting with the next fiscal year, an In-Service Bulletin will be issued as new information or training material becomes available.



# COUNTIES RANKING HIGHEST BY COMBINED POPULATION AND AREA MALARIA DEATH RATES 1938-1942



LEGEND

COMBINED RANK AS DETERMINED BY (1) RANK ACCORDING TO MALARIA DEATHS PER 100,000 POPULATION AND (2) RANK ACCORDING TO MALARIA DEATHS PER 1,000 SQUARE MILES

FIRST FORTY COUNTIES  
SECOND FORTY COUNTIES  
THIRD FORTY COUNTIES

120 COUNTIES HAVING HIGHEST  
COMBINED RANK ACCORDING TO  
MALARIA DEATH RATES BY POPULATION  
AND BY AREA IN 16 STATES

1938-1942

MORTALITY STATISTICS FROM BUREAU OF THE CENSUS  
AND STATE HEALTH DEPARTMENTS

SCALE OF MILES  
0 50 100  
PLATE III